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TM 9-1617

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

GENERATING UNIT M18

RESTRICTED DISSEMINATION OF RESTRICTED MATTER — No person is entitled solely by virtue of his grade or position to knowledge or possession of classified matter. Such matter is entrusted only to those individuals whose official duties require such knowledge or possession. (See also paragraph 23*b*, AR 380-5, 15 March 1944.)

WAR DEPARTMENT • *16 NOVEMBER 1944*

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WAR DEPARTMENT TECHNICAL MANUAL
TM 9-1617

This Technical Manual supersedes TB ORD 74 in so far as it applies to TM 9-1617. TB ORD 74 remains in effect until it is incorporated in other affected manuals or specifically rescinded.

ORDNANCE MAINTENANCE

GENERATING UNIT M18

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WAR DEPARTMENT • *16 NOVEMBER 1944*

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WAR DEPARTMENT

Washington 25, D. C., 16 November 1944

TM 9-1617, Ordnance Maintenance: Generating Unit M18, is published for the information and guidance of all concerned.

[A.G. 300.7 (3 Oct 44)
O.O. 461/57117 Misc.]

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(For explanation of symbols, see FM 21-6.)

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CHAPTER 1

INTRODUCTION

1. SCOPE.

a. This Technical Manual is published for the information and guidance of ordnance maintenance personnel. It contains detailed instructions for inspection, disassembly, assembly, and repair of the Generating Unit M18, supplementary to those in the Field Manuals and Technical Manuals for the using arm. Service operations, such as removal and installation of many accessories which are covered in TM 9-617, are omitted from this manual.

2. CHARACTERISTICS.

a. General. The Generating Unit M18 (figs. 1, 2, and 3) is a gasoline-engine-driven generator used to provide electric current for operation of a battery of antiaircraft guns. It is mounted on a welded-steel frame either for use on a specially designed trailer or set upon wooden skids. The radiator end of the unit is considered the front. Right and left sides are determined from the rear, facing toward the radiator.

b. Engine (figs. 2 and 3). The engine is a six-cylinder, water-cooled gasoline engine, developing approximately 67 horsepower at 1,200 revolutions per minute. It is directly connected to the a-c generator by a flexible coupling. The engine is equipped with two electric starting motors, a battery charging generator with a two-charge regulator, an oil-bath air cleaner, and an oil filter. Engine speeds are controlled by a mechanical flyball-type governor.

3. DATA.

Model:	
Generator	M3
Engine	Hercules WXLC-3
Weight, dry (complete unit)	4,194 lb
Dimensions, over-all	100½ x 41⅝ x 56⅝ in.
Rated generator output	30kw (80 percent power factor), 3-phase, 60-cycle, 125-volt; or 30kw (80 percent power factor), 3-phase 60-cycle, 250-volt

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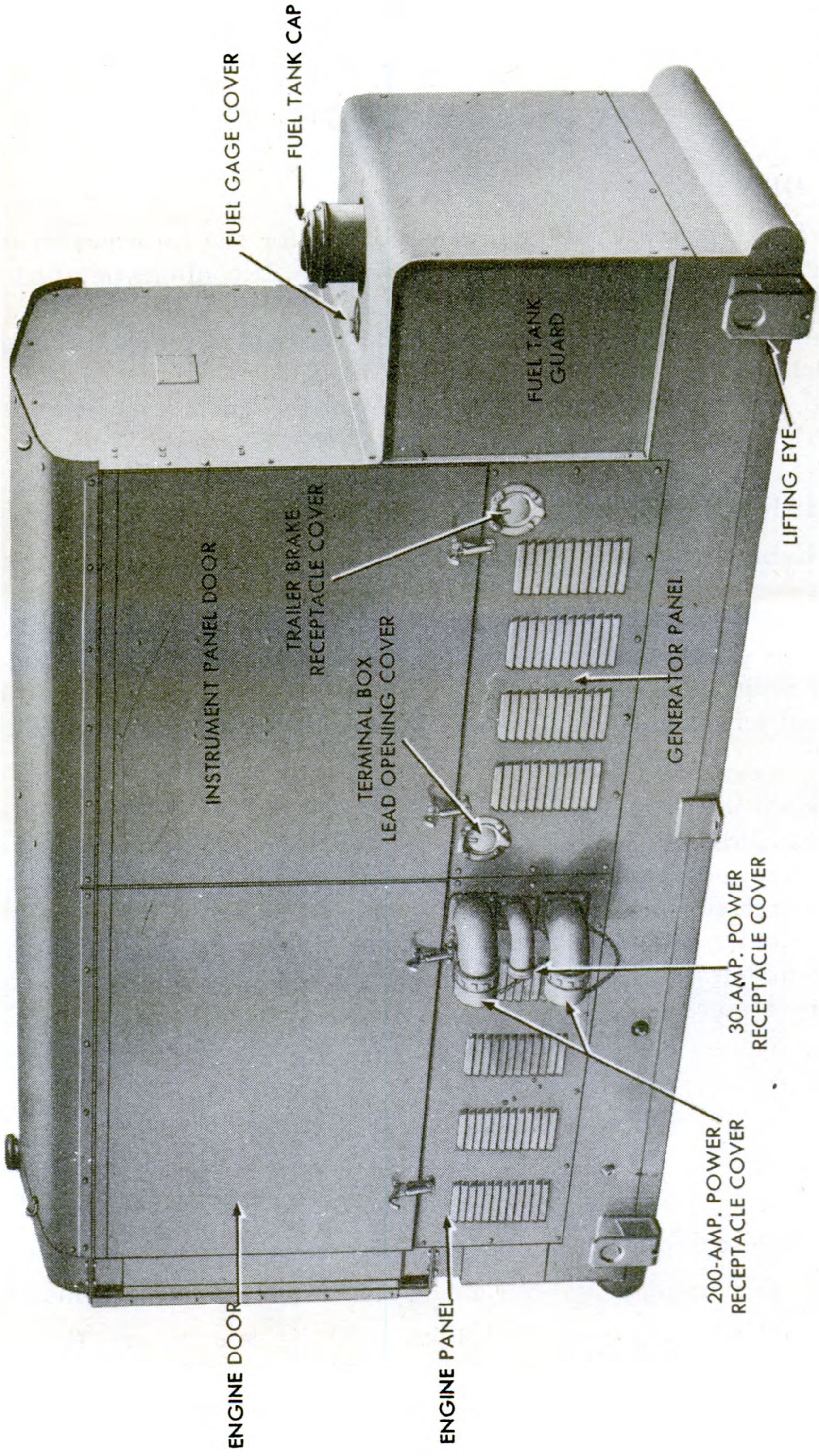
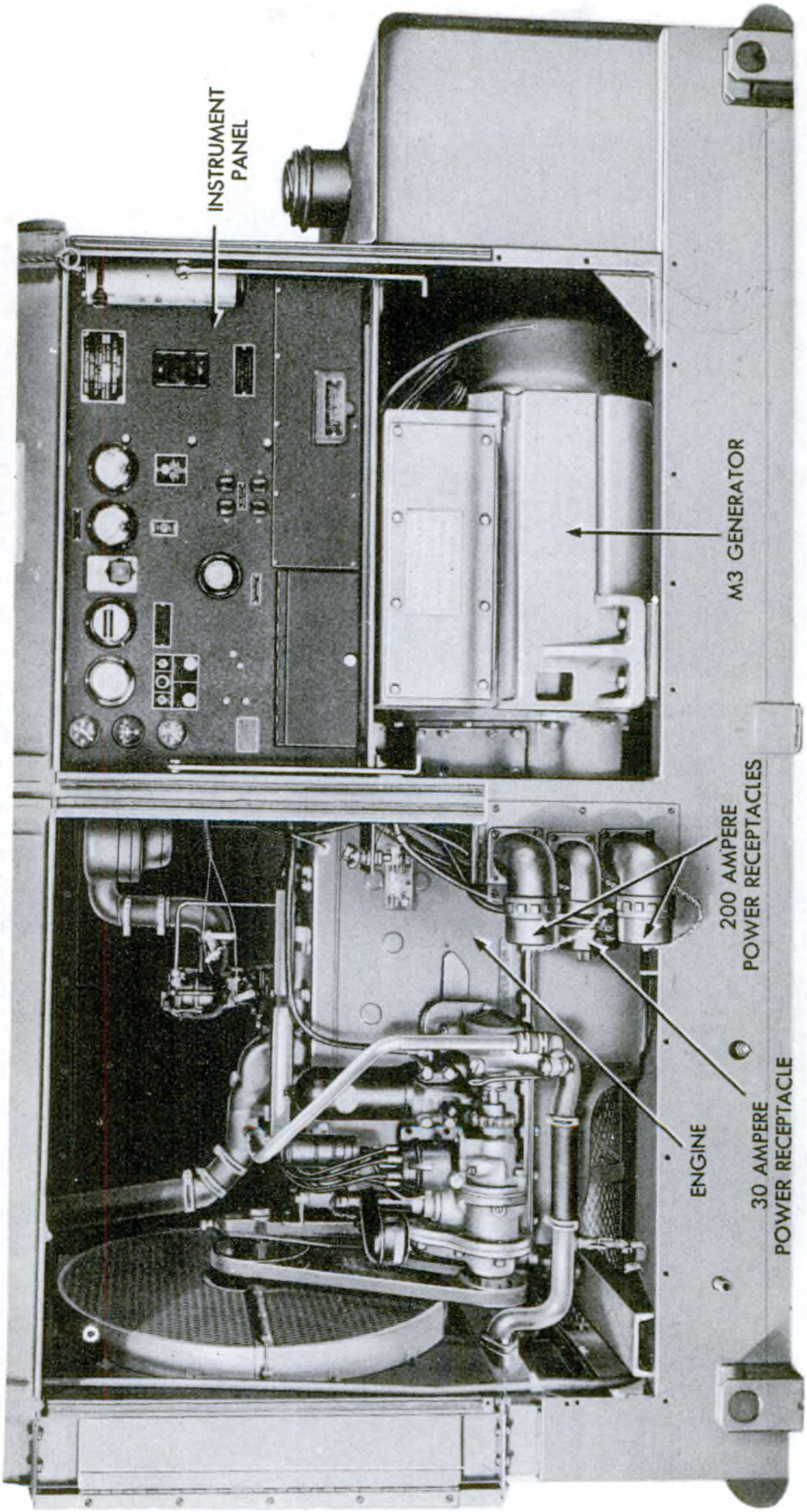

FUEL GAGE COVER
FUEL TANK CAP
FUEL TANK GUARD
INSTRUMENT PANEL DOOR
TRAILER BRAKE RECEPTACLE COVER
TERMINAL BOX LEAD OPENING COVER
GENERATOR PANEL
LIFTING EYE
30-AMP. POWER RECEPTACLE COVER
200-AMP. POWER RECEPTACLE COVER
ENGINE DOOR
ENGINE PANEL

RA PD 78103

Figure 1—Generating Unit M18—Left Rear

INTRODUCTION


INSTRUMENT PANEL
M3 GENERATOR
200 AMPERE POWER RECEPTACLES
ENGINE
30 AMPERE POWER RECEPTACLE

RA PD 78545

Figure 2—Generating Unit M18—Doors Open and Panels Removed—Left Side

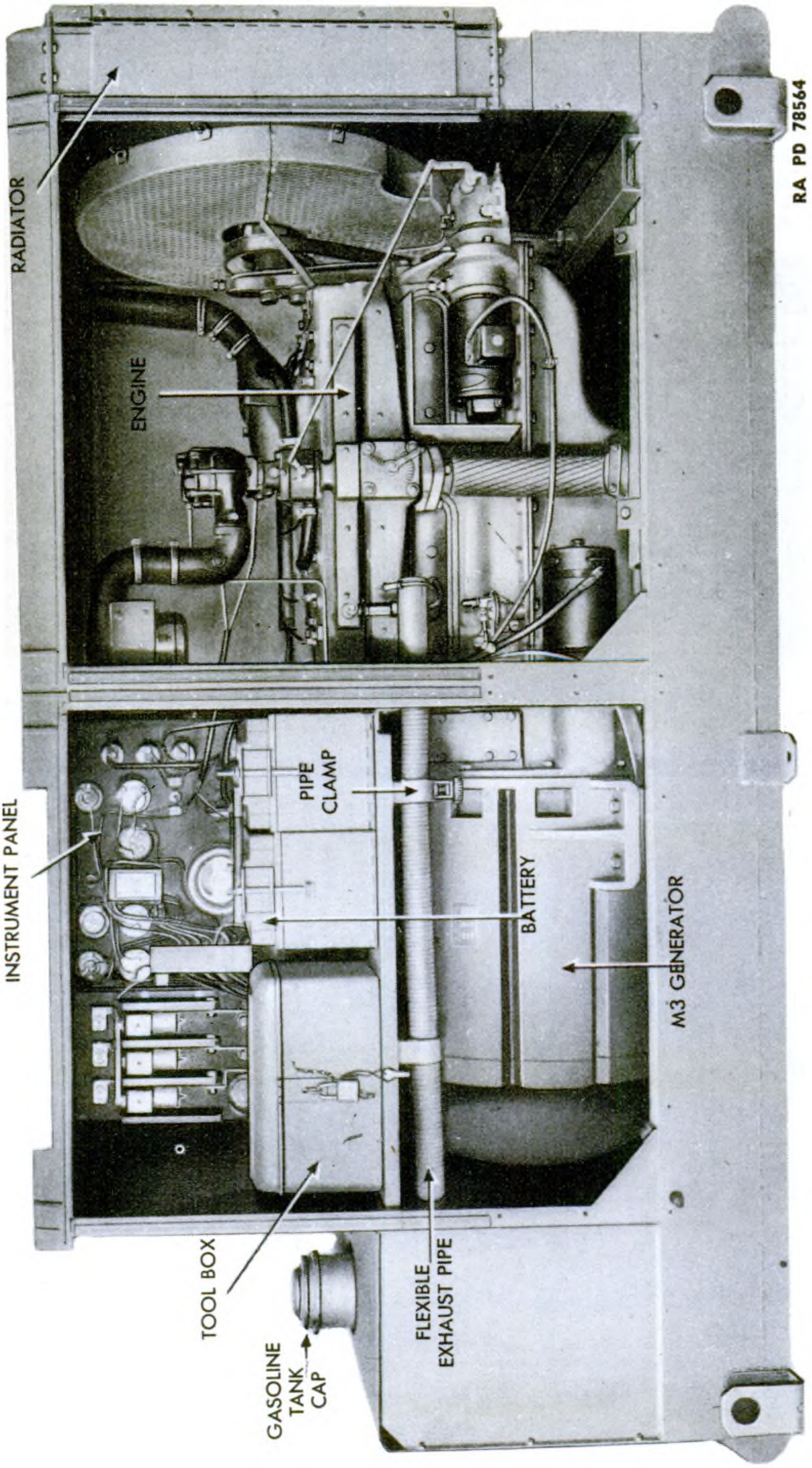

RADIATOR
ENGINE
INSTRUMENT PANEL
PIPE CLAMP
BATTERY
M3 GENERATOR
TOOL BOX
GASOLINE TANK CAP
FLEXIBLE EXHAUST PIPE
RA PD 78564

Figure 3—Generating Unit M18—Doors Open and Panels Removed—Right Side

CHAPTER 2

BASIC INSPECTION

4. GENERAL.

a. Scope. This section covers specific instructions for inspection by ordnance personnel of the materiel in the hands of troops, as well as instructions for higher echelons. General inspection instructions are contained in TM 9-1100, Inspection of Ordnance Materiel. The inspector should be well versed in maintenance procedures for the materiel and must have a working knowledge of the tools needed for its inspection.

b. Purpose.

(1) Fundamentally, inspection is for the purpose of determining whether or not the generating unit is serviceable, or the extent of its serviceability. Important but secondary purposes are the detection of incipient failure and the determination of whether or not proper care is being taken of the unit and accessories. Serviceability, as interpreted in this section, is the ability of the materiel to perform its intended functions completely.

(2) In the event the generating unit is unserviceable or incipient failures are disclosed, the cause and extent of the unserviceability will be determined. Such deficiencies as are found will be corrected on the spot or corrective measures will be taken. If the materiel must be "deadlined" or sent to a higher maintenance echelon for repair, it will be thoroughly and completely inspected, put into the best possible condition that time, materials, and tactical circumstances will allow, and returned to the using arm ready for immediate use.

c. Reports.

(1) Suggested improvements in design, maintenance, safety, and efficiency of operation, prompted by chronic failure or malfunction of the unit, spare parts, accessories, or equipment should be forwarded to the Office of the Chief of Ordnance, Field Service, Maintenance Division, with all pertinent information necessary to initiate corrective action. This information should be reported on WD AGO Form No. 468, Unsatisfactory Equipment Report. Such suggestions are encouraged so that other organizations may benefit from them.

(2) Report to the responsible officer any persistent carelessness or negligence in the observance of preventive maintenance procedures and safety precautions. This report should be accompanied by recommendations for correcting the unsatisfactory conditions. NOTE: *The inspector's aim is not to find fault with the using troops, but to be helpful.*

5. SPECIAL TOOLS.

a. Simplicity of design of the generating unit makes it possible to perform all repair operations covered in this manual with standard automotive equipment.

6. INSPECTION RECORD.

a. A permanent record, listing any maintenance performed, should be kept of each inspection. A suitable inspection form, with an itemized listing of the points of inspection, can be prepared locally as a guide for maintenance personnel. Utility of the form will be increased if space is provided to record the date, action taken, and remarks for each period of inspection.

7. ENGINE AND ACCESSORIES.

a. Engine Proper.

(1) Check exterior of engine oil pan, cylinder block, and cylinder head for cracks or leaks. Check for presence and condition of all gaskets. See that all cap screws and nuts are tight and equipped with lock nuts (if required).

(2) Test compression of engine (par. 10 **c**).

(3) Apply vacuum test to engine (par. 10 **d**).

(4) Run engine and observe functioning. Listen for piston slap, bearing knock, carbon knock, or other noises indicating malfunction.

b. Cooling System.

(1) Examine radiator for signs of leakage, bent fins, dirt in fins, dented or bent tubes or tanks, clogged overflow tube, nonfunctioning or missing doors, missing or poorly fitting radiator cap, and for dirt or rust in interior.

(2) Examine hose connection for leakage, loose clamps, or deterioration due to age. Feel hose for sponge-like deterioration on inside.

(3) Test operation of drain valve and inspect valve for leakage.

(4) Inspect water pump for cracks or leakage. Note position of water pump packing nut. If it is drawn up nearly to end of thread, need for repacking is indicated. Ascertain that shaft rotates freely.

(5) Inspect fan and bracket to see if either is broken or bent.

(6) Check fan belt for tension and for cracking, fraying, breaking, and to see if it is oil-soaked.

(7) Start engine to ascertain if cooling system functions properly. Remove radiator cap and see if coolant circulates properly after engine warms up and thermostat opens. Note fan to see if it vibrates or runs noisily.

BASIC INSPECTION

c. Battery Charging Generator and Regulator.

(1) Run engine and check functioning of charging system. Although a fully charged battery will cause the regulator to cut down charging rate, a charge should be shown by ammeter immediately after starting engine.

(2) Remove generator head band and check brushes for arcing. Stop engine and inspect brushes to see if they are broken or worn out (usable to one-half original length). Check spring tension of brush springs to see if they hold brushes snugly against commutator. Spring tension on collector brushes is 8 ounces per brush (minimum); on commutator brushes, 12 to 14 ounces. Notice if commutator is roughened. Inspect wiring to see if all connections are tight. Burned or scorched lead wires or coils indicate a short circuit. Test generator securing screw and lock washer for tightness.

(3) Remove cover from generator regulator. Check voltage regulator spring and circuit breaker springs to see that they are securely hooked to armatures and frames. Check resistor nuts and terminal screw for tightness. Check points to see if they are pitted or dirty. Check air gaps of armatures and contacts of voltage regulator and circuit breaker (par. 50 **c**). Remove screws which attach regulator to generator. Check terminal screws for tightness. Inspect all wires and coils to ascertain condition of insulation.

d. Ignition System.

(1) Test operation of spark coil (par. 53 **a**). Examine case and cover for cracks or damage from accident. Note condition of threads on terminals. Check for presence and tightness of lock washers and nuts on attaching screws and terminals.

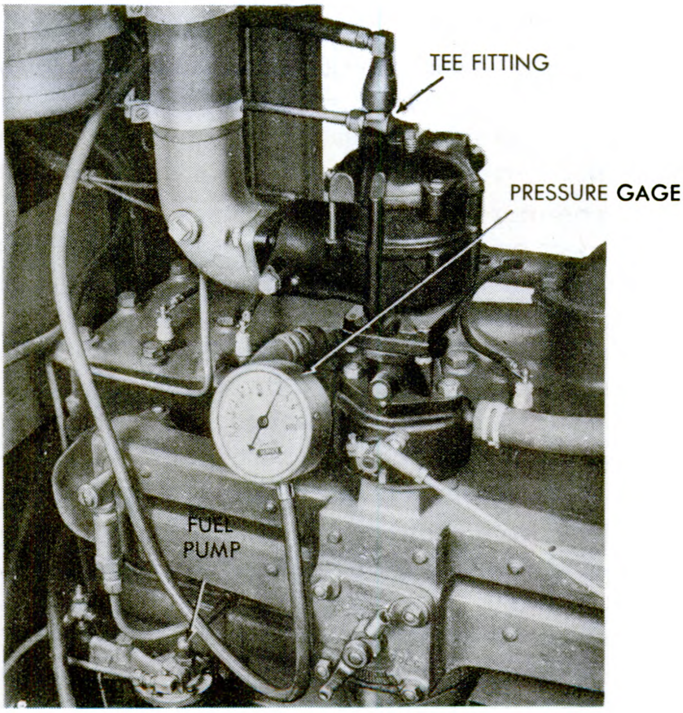
(2) Test and inspect spark plugs (par. 55 **a**).

(3) Remove distributor cap and inspect for presence of cracks, or burned or pitted cap inserts. Remove rotor and inspect for cracks and bent, scored, pitted, or worn contact spring and tip. Remove plate which covers points and condenser. Inspect breaker points for pitting or burning. Check breaker point gap, and set at 0.020 inch. Check cam for wear. Test shaft for side play indicating bearing wear, and for backlash indicating gear wear.

(4) Test distributor timing and adjust if necessary (par. 54 **g**).

e. Starting Motors and Batteries.

(1) Test action of starting motors. Check tightness of attaching cap screws and terminal nuts. Check for presence of lock washers on attaching screws and terminals. Remove head band. Check brushes to see if they arc, or are broken or worn out (usable to one-half original length). Test tightness of wire connections. See if commutator is scored or roughened.



RA PD 79571

Figure 4—Testing Fuel Pump Pressure

(2) Check batteries with hydrometer to see if they are fully charged and in good condition. Inspect cases for cracks, connections for tightness and corrosion, and wires for condition of insulation.

f. Fuel System.

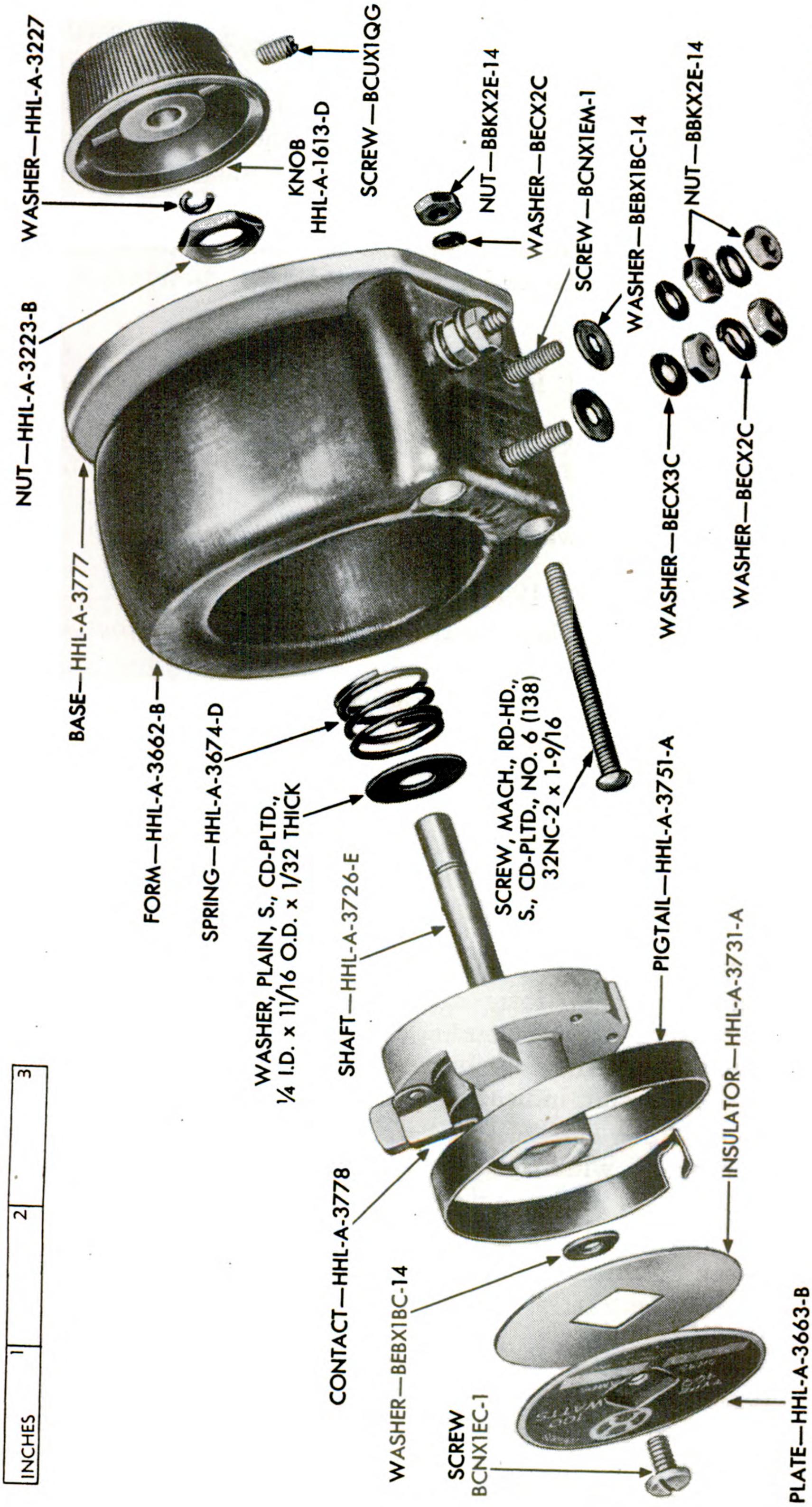
(1) Check gasoline tank for presence and condition of filler cap, flame arrester screen, and fuel gage. Check for leaks. Check tightness of pipe plug and fuel line connections. Check for dents serious enough to impair strength or capacity of tank.

(2) Check fuel lines, drain and shut-off valves for security of attachment, for leakage, for functioning, and for tightness of all connections.

(3) Inspect fuel pump case and sediment bowl for cracks and leaks. Check tightness of body screws and attaching screws. Check for presence of lock washers on screws. Check for sediment, water, and dirt in sediment bowl and screen. In case of doubtful fuel pump action, disconnect pump to carburetor tube and connect a tee fitting into it. Connect a pressure gage to the tee fitting, start engine, and measure the pressure the pump develops (fig. 4). It should develop a minimum of 2 pounds pressure.

(4) Inspect carburetor for leaks and security of attachment. Test

INSTRUMENT PANEL


WASHER—HHL-A-3227
SCREW—BCUX1QG
KNOB
HHL-A-1613-D
NUT—HHL-A-3223-B
NUT—BBKX2E-14
WASHER—BECX2C
SCREW—BCNX1EM-1
WASHER—BEBX1BC-14
NUT—BBKX2E-14
BASE—HHL-A-3777
FORM—HHL-A-3662-B
SPRING—HHL-A-3674-D
WASHER, PLAIN, S., CD-PLTD.,
¼ I.D. x 11/16 O.D. x 1/32 THICK
SHAFT—HHL-A-3726-E
SCREW, MACH., RD-HD.,
S., CD-PLTD., NO. 6 (138)
32NC-2 x 1-9/16
WASHER—BECX3C
WASHER—BECX2C
PIGTAIL—HHL-A-3751-A
INSULATOR—HHL-A-3731-A
CONTACT—HHL-A-3778
WASHER—BEBX1BC-14
SCREW
BCNX1EC-1
PLATE—HHL-A-3663-B
INCHES
1
2
3

RA PD 78431

Figure 194—Lamp Dimmer Rheostat Disassembled

(2) On top terminal screw, install plain washer, lock washer, nut, second lock washer and nut.

(3) Slide flat washer and spring onto front end of shaft. Insert shaft through shaft hole in base. Slide contact pig tail under head of rear terminal screw and tighten both nuts on screw.

(4) On front of shaft, install nut, snap washer, and knob.

(5) Position washer, insulator, and plate on rear of contact base. Install the screw which secures the parts to the base.

110. 125-VOLT LAMP SOCKETS.

a. **Description** (figs. 186 and 187). The two 125-volt screw type lamp sockets at the top of the instrument panel are of soft molded rubber construction. Lead wires, which project from the backs of sockets, are soldered to metal contact and shell.

b. **Inspection and Repair.** Inspect contact and shell to see if they are bent or corroded. Inspect rubber mounting to see if it is torn. Test functioning of socket by screwing a lamp into it and applying current to the leads. If corroded, clean contacts with class B flint paper, No. 2/0. If inspection reveals any other damage to lamp socket, replace the entire assembly since it cannot be disassembled.

111. 6-VOLT LAMP AND TROUBLE LIGHT SOCKETS.

a. **Description** (figs. 186 and 187). Two identical single-contact 6-volt sockets are installed on the panel. One serves as a receptacle for the 6-volt panel lamp at the top of the panel. The other is located in the engine control group and is intended to be used as a receptacle for a 6-volt trouble light. These receptacles are standard automotive type, single-contact, threaded neck, bayonet sockets.

b. **Inspection and Repair.** Clean corrosion from contact and inside of socket with class B flint paper, No. 2/0. Inspect the assembly to see if metal parts are bent or insulating parts are broken. Test operation by inserting a lamp into socket. Apply current to lead and metal part of socket. If lamp fails to light, or if other defect is discovered upon inspection, replace the entire assembly.

112. 125-VOLT T-SLOT RECEPTACLE.

a. **Description** (figs. 186 and 187). The two duplex receptacles are of molded one-piece construction. They are similar to receptacles commonly employed in the household light circuits. The case is made of bakelite, and contacts are composed of strip copper. Each receptacle is fitted with screw type terminals on its sides. Capacity rating of the receptacles is 125 volts and 15 amperes.

b. Inspection and Repair. Inspect bakelite to see if it is broken. Clean corrosion from terminals and contact points with class B flint paper, No. 2/0. Test operation by connecting a source of current to terminals and inserting a plug connected to a lamp in T-slot. Normal lighting of lamp indicates satisfactory operation of receptacle. Replace receptacle if case is broken or if receptacle is inoperative.

113. TERMINAL BLOCKS.

a. Description (fig. 187). Two terminal blocks are mounted on the rear of the instrument panel. The smaller of the two is near the front end of the panel and is used as a junction for the engine electrical system. The larger terminal block is attached to the iron channels which mount the circuit breaker panel assembly. It serves as a junction for the alternating-current system. The smaller terminal block has four sets of terminals while the larger terminal block has 12 sets of terminals. However, only nine of the sets of terminals on the larger terminal block are used. Each of the terminal blocks consists of a bakelite base with divider strips molded between the pairs of terminals and equipped with metal inserts to receive screws. Each block is equipped with a fiber cover which attaches to the base with four screws.

b. Removal (fig. 187).

(1) Remove the four screws which attach terminal cover to terminal block. Lift cover from block.

(2) Disconnect all wires from terminals of terminal block.

(3) Remove the screws which attach designation strip along center of terminal block.

(4) Remove the two nuts, lock washers, and screws which attach terminal block to instrument panel (engine electrical system terminal block) or circuit breaker panel assembly channel (alternating-current system terminal block). Lift block from unit.

c. Inspection and Repair.

(1) Inspect terminal block cover, designation strip, and base to see if they are cracked or broken.

(2) Inspect copper strips and brass screws which make up terminals to see if they are corroded or damaged. Clean corrosion from parts with fine class B flint paper, No. 2/0. Straighten or replace bent metal parts.

(3) Inspect all screws, nuts, and lock washers to see if they are bent, broken, or have damaged threads. Remove burs with a fine mill file.

d. Installation (fig. 187).

(1) Position terminal block on unit (engine electrical system terminal block on instrument panel; alternating-current system terminal block on circuit breaker panel assembly channel).

(2) Install the two screws, lock washers, and nuts which attach terminal block to unit. Position designated strip in groove along center of terminal block and install the screws which attach strip to terminal block base.

(3) Connect wires to terminals of terminal block as shown in wiring diagram (fig. 141).

(4) Place cover in position on back of terminal block and install the four screws which attach cover to terminal block base.

114. FUSE BLOCKS.

a. Description (figs. 187 and 191). Two fuse blocks are used. They are of similar construction although one is designed to accommodate two fuses while the other is a single fuse model. Each fuse block consists of a bakelite base to which brass fuse clips and terminal assembly are attached by screws. The double fuse block is mounted on the circuit breaker panel assembly channel above the large terminal block. The single fuse block is attached to the rear of the instrument panel adjacent to the small terminal block. Capacity rating of the fuse blocks is 250-volts and 30 amperes.

b. Removal (fig. 187).

(1) Pull fuse or fuses from block and disconnect all wires from fuse block terminals.

(2) Remove the two screws which attach fuse block to unit (double fuse block to circuit breaker panel assembly channel; single fuse block to instrument panel).

c. Inspection and Repair.

(1) Inspect base to see if it is broken. If base is broken, replace the fuse block.

(2) Inspect clips and terminals to see if they are bent, broken, or corroded. Clean corrosion from contacts and terminals with class B flint paper, No. 2/0. Straighten clips and terminals if bent. Replace fuse block if clips or terminals are broken or if threads on terminal block or screws are stripped.

d. Installation (fig. 187).

(1) Position fuse block on unit (double fuse block on circuit breaker panel assembly channel; single fuse block on instrument panel). Install the two screws which attach block.

(2) Connect wires as follows:

(*a*) Single fuse block: to bottom terminal, wire No. 61 from terminal block; to top terminal, wire No. 63 from terminal block.

(*b*) Double fuse block: to lower left terminal, wire No. 2C from overload switch and wire No. 2C from terminal block; to upper left-hand internal, wire No. 14 from instrument panel light switch and wire No. 14 from T-slot receptacle; to lower right-hand terminal, wire No. 2A from circuit breaker and wire No. 2A from terminal block; to upper right-hand terminal, wire No. 12 from instrument panel light switch, and wire No. 12 from T-slot receptacle.

(3) Push fuse or fuses into position in clips.

Section IV

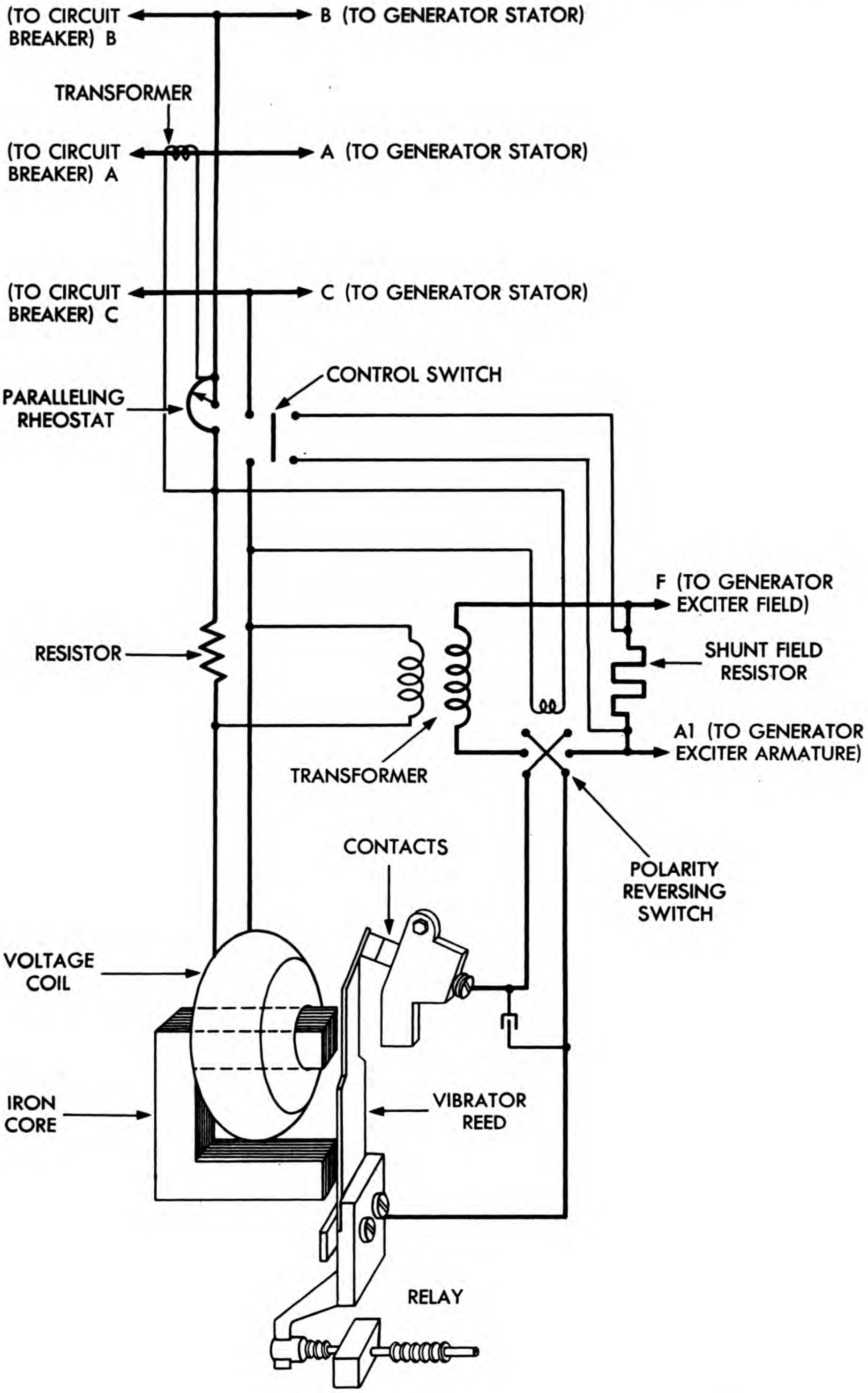
VOLTAGE REGULATOR

115. DESCRIPTION (fig. 195).

a. The voltage regulator is installed on the rear of the instrument panel below the circuit breaker panel assembly. Its function is to automatically control the voltage of the generator output under varying load conditions. Fine adjustment enables the voltage regulator to keep the generator's output from varying, except momentarily, more than plus or minus 2 percent of its rated voltage.

b. A voltage coil, connected across two phases of the a-c generator, is energized by the generator output. This coil magnetizes a laminated iron core which attracts a vibrator reed. One of a pair of contacts is mounted on the vibrator reed so that when the vibrator is drawn to the core, the contacts are open. When the coil is not energized, the contacts close and short circuit a shunt field resistor. Because the generator delivers alternating current, the magnetic flux is pulsating. The vibrator pulsates 120 times per second. The contacts open slightly each time the voltage wave reaches a positive or negative maximum and close each time the voltage wave goes through zero.

c. Terminal voltage of the generator determines the length of time the contacts remain open during each pulsation. When the load is removed from the generator, the generator voltage rises. This opens the contacts for a longer period. The exciter shunt field resistor, therefore, is inserted into the field circuit of the exciter for a longer period. Thus, the alternator field excitation is cut, and generator output drops to normal. Generator terminal voltage drops when a


(TO CIRCUIT BREAKER) B
B (TO GENERATOR STATOR)
TRANSFORMER
(TO CIRCUIT BREAKER) A
A (TO GENERATOR STATOR)
(TO CIRCUIT BREAKER) C
C (TO GENERATOR STATOR)
CONTROL SWITCH
PARALLELING RHEOSTAT
F (TO GENERATOR EXCITER FIELD)
RESISTOR
SHUNT FIELD RESISTOR
A1 (TO GENERATOR EXCITER ARMATURE)
TRANSFORMER
CONTACTS
POLARITY REVERSING SWITCH
VOLTAGE COIL
IRON CORE
VIBRATOR REED
RELAY

RA PD 78578

Figure 195—Voltage Control Wiring Diagram—Simplified

load is added to the generator. The contacts then remain closed for a longer period, or do not open at all. Since this shorts the shunt resistance in the exciter field, more excitation is delivered to the alternator field coils. This causes the output to rise quickly to normal.

d. A polarity reversing switch is provided to reverse the direction of the direct current through the contacts every 4 hours. This prevents excessive building up or pitting of the tungsten contacts. Sparking and improper wear of the contacts is further minimized by means of spark-suppressor condensers. These condensers are connected across the contact circuit.

e. Radio shielding is built into the voltage regulator in order to prevent interference with radio equipment. A grounded metal enclosure prevents radiation from the voltage regulator itself. Filter circuits prevent radiation from the leads which are brought out of the enclosure. Choke coils, having small values of inductance, oppose the flow of high-frequency currents. These coils have negligible effect upon either direct current or 60-cycle current. The condensers in the filter circuits block the flow of 60-cycle alternating current, but not the high-frequency currents. Thus, these condensers act like valves. They ground high-frequency currents, but oppose the flow of low-frequency or direct current to ground.

116. REMOVAL (figs. 187 and 141).

a. Remove tool box.

b. Disconnect the three bus bar connectors from terminals on circuit breaker panel assembly and load terminal box. Lift bus bars from unit.

c. Disconnect main generator lead wires "A," "B," and "C" from circuit breaker panel assembly. Disconnect main generator lead wire "O" from load terminal box.

d. Disconnect voltage regulator lead wires "R5" and "R6" from correspondingly marked lead wires from cross-current compensating transformer on circuit breaker panel assembly.

e. Disconnect voltage regulator "2C," "2B," and "F" lead wires from corresponding terminals of terminal block.

f. Disconnect voltage regulator lead wire "R4" from "R4" terminal of exciter field rheostat.

g. Remove the eight flathead screws which secure voltage regulator to instrument panel. Lift voltage regulator from rear of instrument panel.

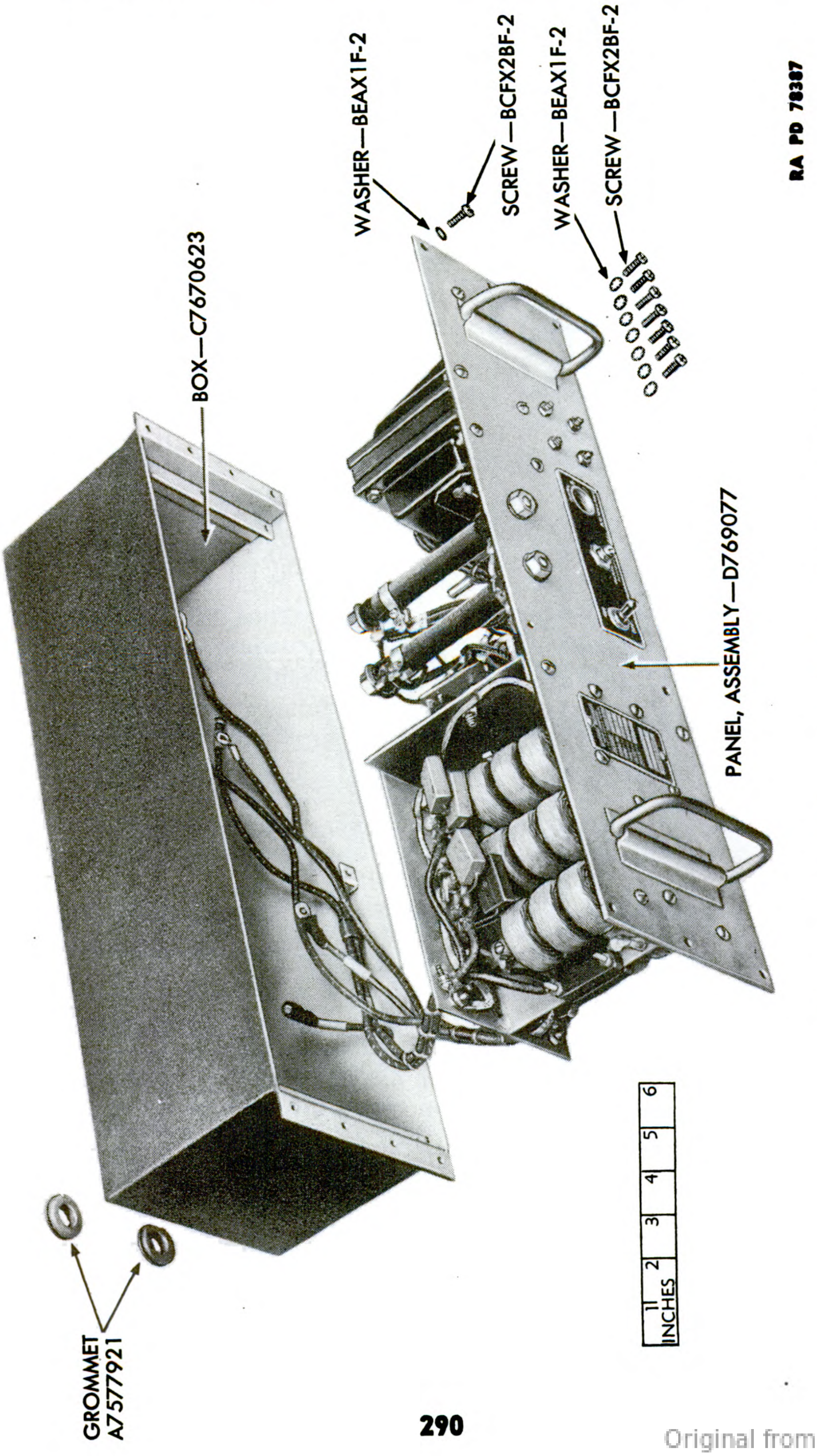

BOX—C7670623
WASHER—BEAX1F-2
SCREW—BCFX2BF-2
WASHER—BEAX1F-2
SCREW—BCFX2BF-2
RA PD 78387
PANEL, ASSEMBLY—D769077
GROMMET A7577921
INCHES 1 2 3 4 5 6

Figure 196—Voltage Regulator—Box Removed

117. DISASSEMBLY.

a. Only partial disassembly is given here. If it proves impossible to make needed repairs with the instructions given here, replace the entire voltage regulator.

b. Remove the eight screws and internal toothed lock washers which attach the panel assembly to the box. Lift box from rear of voltage regulator (fig. 196).

c. Pry the two rubber grommets from the wire exit holes in the rear of the box (fig. 215).

d. Remove relay assembly (under transformer) from panel as follows (fig. 198):

(1) Remove the nut, washer, and screw which attach ground wire to panel.

(2) Disconnect lead wires "7B" and "8C" from terminals on coil. Disconnect lead wire "B" from terminal on contact adjusting screw post. Disconnect lead wire "A" from screw which attaches it to insulated plate at center of bracket.

(3) Remove the four nuts, internal toothed lock washers, and screws which attach bracket to panel. Lift relay assembly from panel.

e. Remove transformer from panel as follows (fig. 198):

(1) Unsolder and remove lead wires "3C" and "3B" from transformer terminal "3."

(2) Unsolder and remove lead wire "0" from transformer terminal "4."

(3) Unsolder and remove lead wires "1" and "2" from transformer terminals "1" and "2" respectively.

(4) Remove the four nuts, internal toothed lock washers, and screws which attach transformer to panel. Lift transformer from panel.

f. Remove resistor A7576987 as follows (fig. 198):

(1) From terminal adjacent to panel, unsolder lead wires "3" and "3B."

(2) From terminal farthest from panel, unsolder and remove lead wires "4," "4B," and "4C."

(3) Remove nut, internal toothed lock washer, and brass washer from stud which attaches resistor to panel. Slide resistor from stud.

g. Remove resistor A7576986 as follows (fig. 198):

(1) From resistor terminal adjacent to panel, unsolder and remove lead wire "5" and unmarked wire from paralleling rheostat.

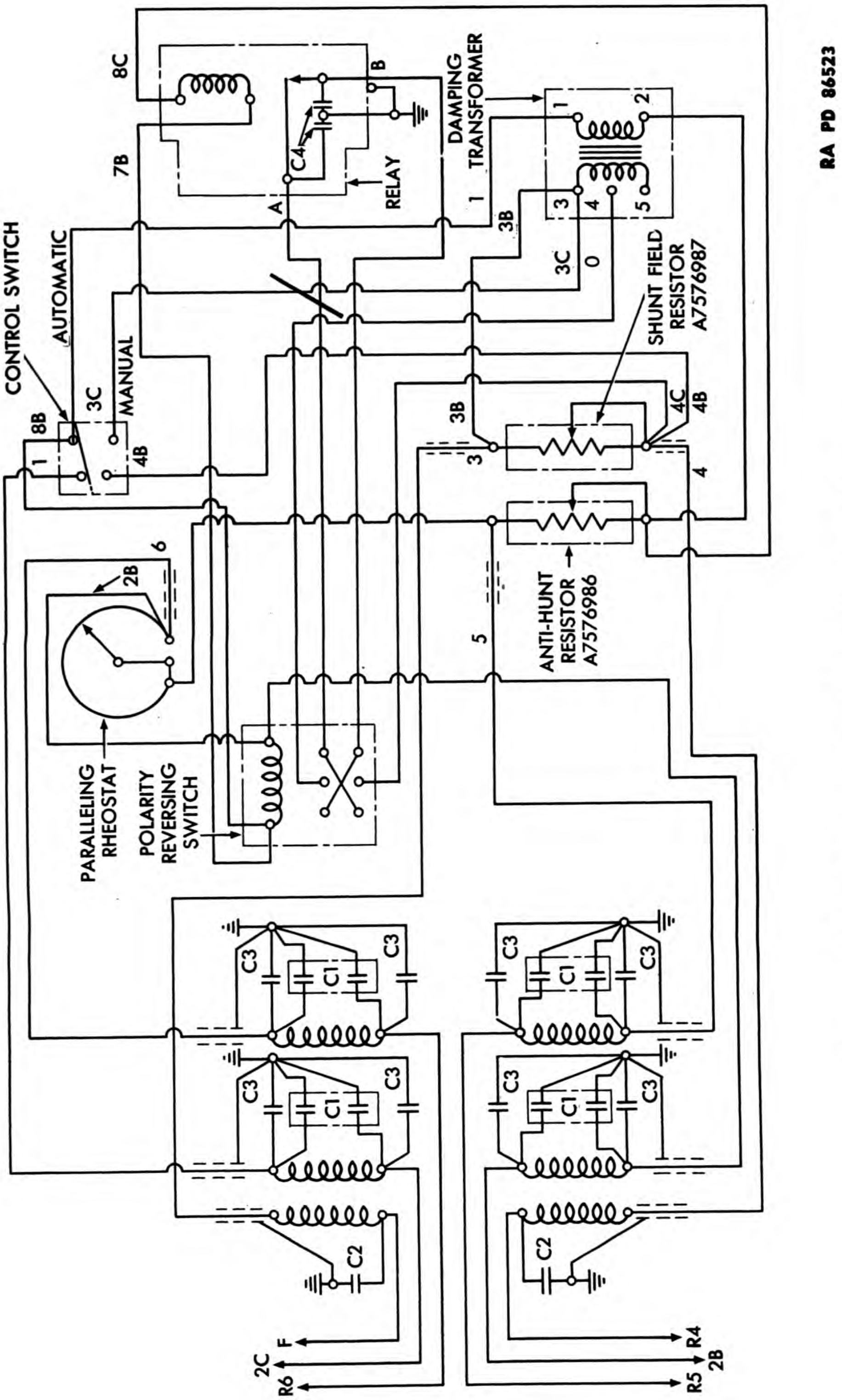

CONTROL SWITCH
AUTOMATIC
MANUAL
8B
3C
1
4B
8C
7B
A
B
C4
RELAY
DAMPING TRANSFORMER
1
2
3
4
5
1
3B
3C
0
SHUNT FIELD RESISTOR A7576987
4C
4B
3B
3
4
ANTI-HUNT RESISTOR A7576986
5
6
2B
PARALLELING RHEOSTAT
POLARITY REVERSING SWITCH
C3
C1
C2
F
2C
R6
R4
2B
R5
RA PD 86523

Figure 197—Voltage Regulator Wiring Diagram

(2) From terminal farthest from panel, unsolder and remove two unmarked lead wires which come from relay and transformer.

(3) Remove nut, internal toothed washer, and brass washer from stud which attaches resistor to panel. Lift resistor from stud.

h. Remove paralleling rheostat A7577920 as follows (fig. 198):

(1) From contact terminal (center terminal), unsolder and remove unmarked lead wire which comes from resistor A7576986.

(2) From right-hand terminal (facing rear of rheostat), unsolder and remove lead wires "6" and "2B."

(3) On front of panel, remove nut which attaches rheostat to panel. With a long thin screwdriver, break solder to detach ground strip from panel between rheostat and rear of panel. Slide rheostat from panel.

i. Remove control switch A7576992 as follows (fig. 196):

(1) From lower left-hand terminal, unsolder and remove lead wire "3C."

(2) From lower right-hand terminal, unsolder and remove lead wire "4B."

(3) From upper left-hand terminal, unsolder and remove lead wire "8B" and unmarked lead wire which goes to the transformer.

(4) From upper right-hand terminal, unsolder and remove lead wire "1."

(5) From front of panel, remove gnurled switch retaining nut. Lift switch and internal toothed lock washer from rear of panel.

j. Remove polarity reversing switch B7635943 together with radio noise suppression units, as follows (fig. 198):

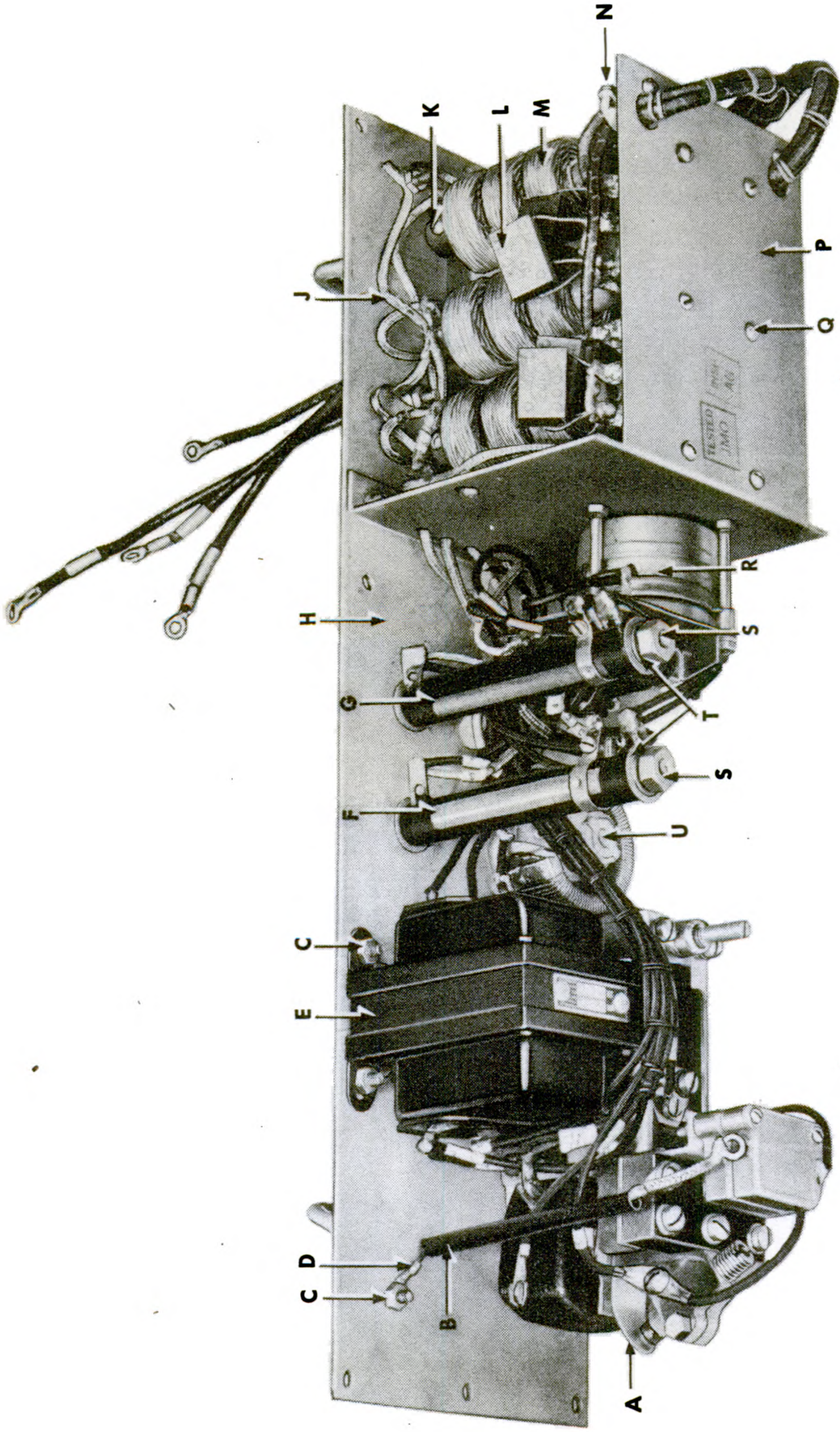
(1) After removing other units from panel, subparagraphs **a** through **h** above, remove the four nuts and screws which attach shielded wire grounding lugs to panel.

(2) Remove six nuts, screws, and lock washers which attach switch to panel. Lift switch assembly from panel.

118. INSPECTION AND REPAIR.

a. Contact Points.

(1) Inspect contact points to see if they are pitted or if sharp points appear on the face. Contact points consist of a 0.040-inch tungsten disk welded to a piece of steel the same diameter. Examine points to see if they are worn so that steel backing is visible through tungsten. If points are pitted or built up irregularly, dress them down on a fine oilstone. Replace contacts if steel backing shows through tungsten points, or if tungsten is worn to less than 0.005-inch thickness.


N
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D
C
B
A

RA PD 78411

Figure 198—Voltage Regulator—Rear View With Box Removed

- A—RELAY, ASSEMBLY—D7690101
- B—TUBING, PLASTIC, NO. 3 x 3" LONG
- C—
  - SCREW—BCNX1FG-2
  - NUT—BBKX2BA-2
  - WASHER—BEAX1E
- D—TERMINAL—A7575200
- E—TRANSFORMER—B7635941
- F—RESISTOR—A7576987
- G—RESISTOR—A7576986
- H—PANEL—B7636760
- J—BRAID, COP., TN-PLTD., ⅛" x 5FT. LONG
- K—
  - SCREW, MACH., RD-HD., S., ZN-PLTD., NO. 6 (.138)—32NC-2 x 2⅝
  - NUT—BBKX2AA-2
  - WASHER—BEAXID
- L—CAPACITOR—A7577009
- M—COIL—B7636622
- N—CLAMP—A7576985
- P—BRACKET—B7636619
- Q—
  - SCREW—BCNX1EE-2
  - NUT—BBKX2AA-2
  - WASHER—BEAX1D
- R—SWITCH—B7635943
- S—
  - STUD—A7576988
  - NUT—BBAX1A-2
  - WASHER—BEAX1H
  - WASHER—BEBX1BG
- T—WASHER—A7576989
- U—RHEOSTAT—A7577920

RA PD 78411A

Legend for Figure 198—Voltage Regulator—Rear View With Box Removed

(2) Replace contact points as follows:

(a) Unscrew stationary contact from adjusting screw and install new stationary contact.

(b) Loosen the two screws which clamp reed in position. Pull reed from relay. Slide new reed into position.

(c) Line up contacts and tighten the two clamp screws securely.

(d) Adjust reed to case air gap (step (3), below).

(3) Check and adjust air gap between reed and laminated iron core. Measure gap with 0.032-inch feeler gage. If necessary, adjust by screwing voltage regulator screw A7577003 to right or left until proper clearance is obtained. Then, check contact points to see if they are closed. If not closed, loosen clamp screw and turn stationary contact adjusting screw until contact is made. Tighten clamp screw.

b. **Resistors.** The capacities of the resistors are 200 and 500 ohms respectively. Capacity is marked on each resistor. Test each resistor with an ohmmeter. If ohmmeter shows reading under resistor capacity, a shorted resistor is indicated. Resistance in excess of resistor capacity indicates an open or partially opened circuit in resistor. Replace resistors which have shorted circuit or open circuit.

c. **Paralleling Rheostat.**

(1) Test paralleling rheostat for an open circuit with a test lamp. Place probes on center and right-hand (facing rear of rheostat) terminals. Turn contact from "OFF" position to full "ON" position. Test lamp should gradually grow brighter during process to full brightness with rheostat fully on.

(2) Inspect rheostat terminals, windings, and contacts to see if they are corroded. Remove corrosion with fine flint paper. Do not remove more wire from windings than absolutely necessary. Blow all dust from rheostat with compressed air.

d. **Control Switch.** Test across both poles of control switch with a test lamp. If lamp lights across either pole with switch off, or if lamp fails to light across either pole with switch on, replace switch.

e. **Transformer.**

(1) With a test lamp, test for continuity of circuit between terminals one and two, three and four, and four and five. Replace transformer if lamp fails to light on any test, as this would indicate an open circuit.

(2) Ground one probe of test lamp to unpainted spot on laminated core of transformer. Touch other probe to each terminal, one at a time. If lamp lights on any test, a grounded circuit is indicated. Replace transformer if grounded.

f. Polarity Reversing Switch.

(1) Inspect all connections on switch to see if any have come unsoldered or disconnected.

(2) Connect 60-cycle, 6-volt, current leads to motor leads. Watch switch-operating cam. A slight movement, at the rate of one revolution every 8 hours, indicates motor is functioning properly.

(3) With switch-operating cam in one of its two positions, test for continuity of its circuit from center terminal to both sets of end terminals with a test lamp. Lamp should light across one pair of poles only. Run motor until switch-operating cam is in other position and repeat test lamp test. Lamp should light across other pair of poles and not across pair on which lamp originally lighted. Replace switch if motor is inoperative or if switch does not function properly, as determined by test lamp checks.

(4) Test the 18 radio noise suppression choke coils for continuity of circuit with a test lamp. Place one probe on each lead. If lamp lights, no open circuit is indicated. Test choke coil for grounded circuit with a test lamp. Place one probe on coil lead, place the other probe on framework. If lamp lights, coil is grounded. Replace assembly if choke coils are grounded or have open circuits. Test coils for open circuit by running 6-volt direct current through each bank of three coils which are connected in series. Measure voltage drop by inserting needle pointed probes of voltmeter into leads from each coil, one coil at a time. Observe reading of voltmeter on each test. If voltage drop is appreciably less on any one coil, a shorted circuit is indicated within that coil. Replace assembly if choke coils are short circuited.

(5) Disconnect one connection of each radio noise suppression condenser. To test radio suppression condenser, connect in series a probe, a source of 90-volt direct current, a neon light, and another probe. Touch the two probes to the two leads from each condenser. Repeat test from ground terminal of condenser to each positive terminal of condenser if condenser has more than one positive connection. If lamps light continuously, a shorted circuit within condenser is indicated. If lamp fails to light at all, an open circuit within condenser or leads is indicated. If lamp blinks on and then goes out, a properly functioning condenser is indicated. Unsolder connections of improperly functioning condensers, and replace condenser with another of the same capacity. Capacity of condenser is stamped on each condenser. After making tests, solder negative lead to ground on each condenser.

119. ASSEMBLY.

a. Install Polarity Reversing Switch, Together With Radio Noise Suppression Units B7635943 (fig. 198).

(1) Position switch assembly on rear of panel. Install the six

screws, lock washers, and nuts which attach switch to panel.

(2) Attach each of the four shielded wire ground lugs to panel with screw and nut provided for the purpose.

(3) Install control switch, paralleling rheostat, resistor, transformer, and relay on panel (subpars. **b** through **g**, below).

b. Install Control Switch (fig. 196).

(1) Position switch in vertical position on rear panel with shaft through panel. Be sure internal toothed lock washer is properly positioned on switch shaft sleeve. Install narrowed switch retaining nut on front of panel.

(2) Solder lead wire "1" to upper right-hand terminal.

(3) On upper left-hand terminal, solder lead "8B" and unmarked lead wire from transformer.

(4) Solder lead wire "4B" to lower right-hand terminal.

(5) Solder lead wire "3C" to lower left-hand terminal.

c. Install Paralleling Rheostat (fig. 198).

(1) Position rheostat on rear of panel with shaft projecting through its hole in panel. Install nut on shaft sleeve in front of panel.

(2) Solder ground strip to panel between rheostat and panel.

(3) Facing rear of rheostat, solder lead wires "6" and "2B" to right-hand terminal.

(4) Solder unmarked lead wire from resistor A7576986 to center terminal. Check for presence of jumper wire from center to left-hand terminals.

d. Install Resistor A7576986 (fig. 198).

(1) Slide resistor into position on right-hand (facing rear of panel) resistor stud. Install brass washer, internal toothed lock washer, and nut on the stud.

(2) Solder the two unmarked lead wires which come from relay and transformer to terminal most remote from panel.

(3) Solder lead wire "5" and unmarked wire from paralleling rheostat to resistor terminal adjacent to panel. Check for presence of jumper wire from terminal farthest from panel to clamp terminal toward center of resistor.

e. Install Resistor A7576987 (fig. 198).

(1) Facing rear of panel, slide resistor onto left-hand resistor stud. Install brass washer, lock washer, and nut on stud.

(2) Solder lead wires "4," "4B," and "4C" to resistor terminal farthest from panel. Check for presence of wire jumper from this terminal to clamp terminal toward center of resistor.

(3) Solder lead wires "3" and "3B" to resistor terminal adjacent to panel.

f. Install Transformer (fig. 198).

(1) Position transformer on rear of panel with screw holes in transformer alined. Install the four screws, internal toothed lock washer, and four nuts which attach transformer to panel.

(2) Solder lead wire "2" to transformer terminal "2."

(3) Solder lead wire "1" to transformer terminal "1."

(4) Solder lead wire "0" to transformer terminal "4."

(5) Solder lead wires "3B" and "3C" to transformer terminal "3."

g. Install Relay Assembly (fig. 198).

(1) Position relay assembly on panel underneath transformer with screw holes in relay base and screw holes in panel alined. Install the four screws, internal toothed lock washers, and nuts which attach relay to panel.

(2) Connect lead wire "A" with screw which attaches it to insulated plate at top center of relay bracket.

(3) Connect lead wire "B" to terminal on contact adjusting screw post.

(4) Connect lead wire "7B" to coil terminal adjacent to transformer.

(5) Connect lead wire "8C" to coil terminal more remote from transformer.

(6) Slide plastic tubing onto relay ground wire and attach ground wire to panel with screw, lock washer, and nut.

h. Install Box (fig. 196).

(1) Snap the two rubber grommets into position in the two wire exit holes on the rear of the box.

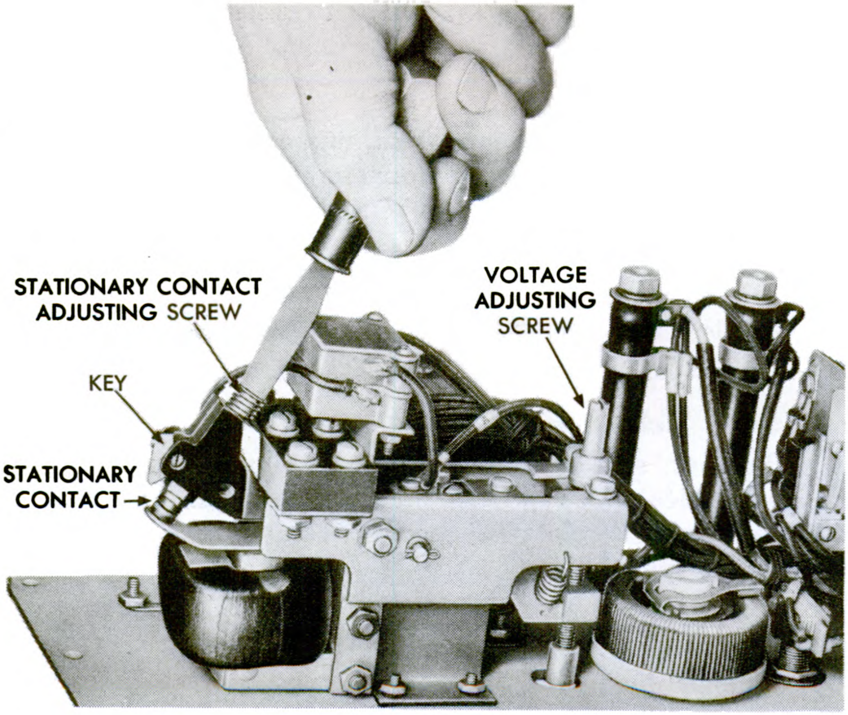
(2) Set voltage regulator assembly in position in its box and install the eight internal toothed lock washers and screws which attach panel to box.

120. INSTALLATION (figs. 187 and 197).

a. Place voltage regulator in position on rear of instrument panel under circuit breaker panel assembly. Install the eight flathead screws which secure voltage regulator to instrument panel.

b. Connect voltage regulator lead wire "R4" to "R4" terminal of exciter field rheostat.

c. Connect voltage regulator wires "2B," "2C," and "F" to corresponding terminals of terminal block.



RA PD 78580

Figure 199—Voltage Regulator Contact Point Adjustment

d. Connect voltage regulator lead wires "R5" and "R6" to correspondingly marked lead wires from cross-current compensating transformer on circuit breaker panel assembly.

e. Connect main generator lead wires "A," "B," and "C" to "A," "B," and "C" terminals, respectively, of breaker panel assembly. Connect main generator lead wire "O" to "O" terminal on rear of load terminal box.

f. Position the three bus bars on "A," "B," and "C" bus bar terminals on circuit breaker panel assembly and on "A," "B," and "C" terminals on rear of load terminal box. Install the flat washers, lock washers, and nuts which attach bus bar to terminals. Be sure to connect power receptacle leads "A," "B," and "C" to "A," "B," and "C" terminals, respectively, on rear of load terminal box when connecting bus bar.

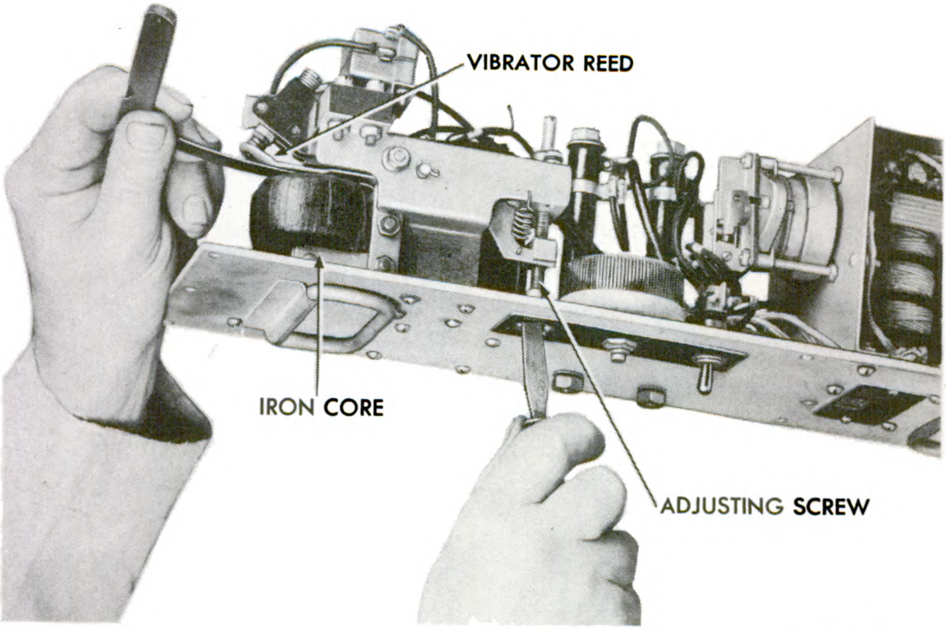
g. Install tool box.

121. ADJUSTMENTS (figs. 199 and 200).

a. Voltage Regulator Adjustment.

(1) Turn field rheostat to position of maximum excitation, therefore maximum voltage. Be sure main switch is off.

INSTRUMENT PANEL



RA PD 78579

Figure 200—Voltage Regulator Air Gap Adjustment

(2) Lift voltage regulator cover (marked "Synchrostat") on front of instrument panel.

(3) Put the "ON-OFF" switch to the "ON" position.

(4) The paralleling rheostat should be adjusted to the normal setting. This setting is approximately one-half way between the "IN" and "OUT" positions. Count the number of turns between the two positions and set the rheostat at the midturn.

(5) Set the desired voltage by adjusting a-c voltage adjusting shaft. Then with main switch on and generator operating under load, make final adjustment of a-c voltage adjusting shaft for desired voltage.

b. Adjustment of Air Gap Between Vibrator and Laminated Iron Core (fig. 200).

(1) Remove front cover plate of voltage regulator.

(2) Remove eight screws and internal toothed local washers which hold voltage regulator box to panel. Pull out voltage regulator box, using the handles on the box. Movement of box is limited because of wires running into right side of box.

(3) The vibrator air gap is adjusted by turning the stationary contact adjusting screw clockwise or counterclockwise. (Clamping screw must be loosened before and tightened after working on stationary contact adjusting screw.)

(4) The air gap between the core and vibrator should be set to approximately 0.032 ($1/32$) inch. Air gap should be checked every 3 months.

c. Maintenance of Regulator Contact Points.

(1) The contact points are subject to some wear in normal operation. Adjustment of voltage adjusting shaft to compensate for contact wear must be made occasionally.

(2) Erratic voltage or inability to maintain normal voltage may indicate that the regulator contacts need attention.

(3) If inspection shows that contacts are quite pitted and there are sharp points on the surface, remove the contacts and dress them down with a fine emery cloth or fine oilstone. After the contacts have been dressed and reinserted, adjust the air gap if necessary.

CHAPTER 7

RADIO INTERFERENCE SUPPRESSION

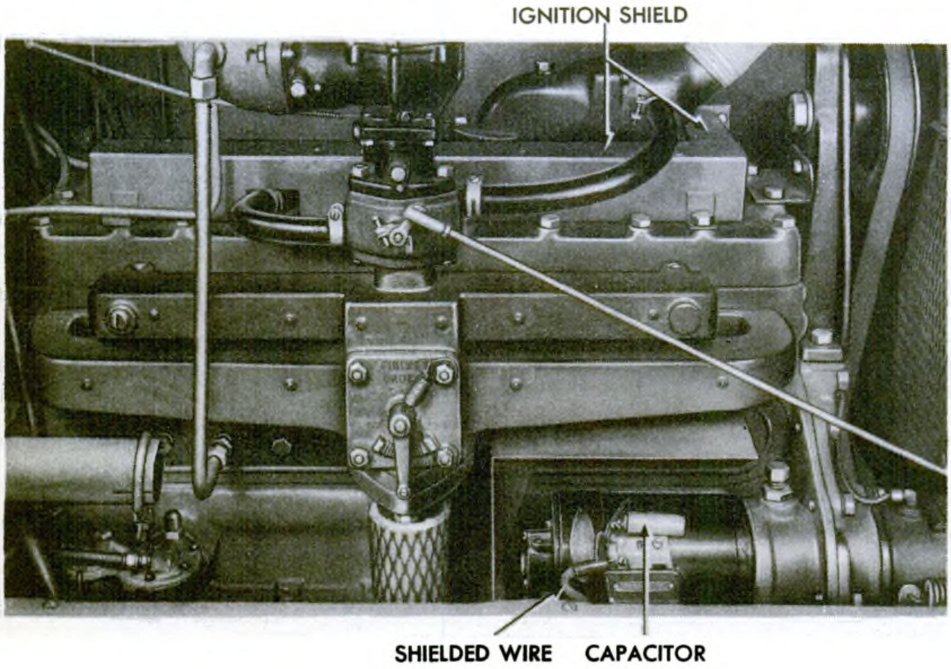
122. DESCRIPTION.

a. **General.** During operation, the generating unit is a source of radio interference. It broadcasts radio waves. This is objectionable because it interferes with reception on nearby wireless equipment. It also enables the enemy to determine the exact location of the unit with detecting instruments. To overcome this handicap, units bearing serial numbers 96 to 138 inclusive were equipped to suppress radio interference. This suppression system consists of ground connectors, ignition shield, capacitors, and suppressors. Each is described as to construction and function in its subparagraph, below. In addition, shielded wire is used for the battery charging generator circuit (fig. 201) and for the ignition primary circuit (fig. 204). This is conventional type electrical wire with a flexible metallic loom covering the insulation. The loom is grounded to the framework of the unit to arrest radio interference.

b. **Ground Connectors** (fig. 203). Six ground connectors are used. Each connector is a woven metal flexible strap with a flat lug soldered to each end. A nut, lock washer, and bolt connect one connector to voltage regulator, generator terminal box, or to one of the four corners of the instrument panel. The other end of each connector is similarly attached to the housing and framework of the unit. Thus the connectors provide continuity of circuit between the instrument panel (with instruments) and the rest of the unit.

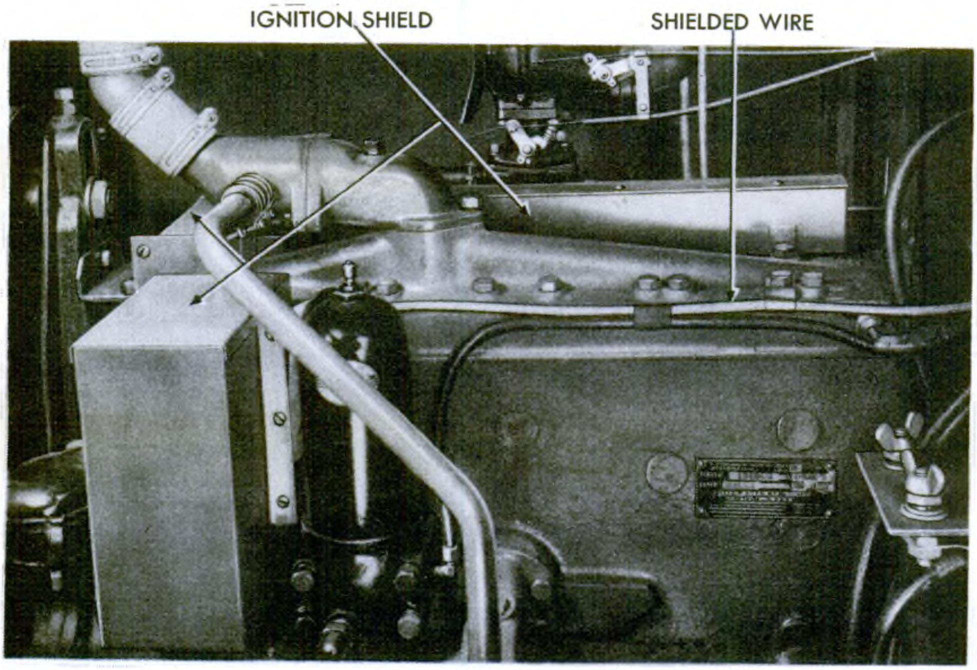
c. **Shield** (figs. 201 and 202). A sheet metal housing completely encloses the engine ignition secondary circuit—distributor, coil, spark plugs, and all high-tension wires. This housing or shield is grounded to the engine and arrests radio interference from the ignition system. The shield is of simple construction. Its sheet metal components are attached to each other with screws, lock washers, and nuts. The entire shield is attached to the engine by means of brackets which fit under heads of cylinder head cap screws.

d. **Capacitors** (figs. 201 and 204). Eight capacitors or condensers are used in the radio noise suppression system. One is mounted on the battery charging generator. Its lead wire is connected to the "CG" terminal of the two-charge regulator. Another capacitor is mounted adjacent to the ignition coil. Its lead wire is attached to the coil "IGN" terminal. The six remaining capacitors are mounted on top of the load terminal box. Their leads are connected to terminal box terminals or bus bar leads "A," "B," "C," "O,"


IGNITION SHIELD
SHIELDED WIRE
CAPACITOR

RA PD 78577

Figure 201—Radio Noise Suppression Units Installed on Engine (1)


IGNITION SHIELD
SHIELDED WIRE

RA PD 78590

Figure 202—Radio Noise Suppression Units Installed on Engine (2)

and to terminal block terminals "CG" and "IGN," respectively. Each capacitor consists of two sheets of metal foil separated by an insulating sheet, rolled, and enclosed in a small cylindrical metal case. One sheet of foil is grounded to the case. The other is connected to the capacitor lead wire. Thus one sheet of foil is connected to each side of its circuit. This close proximity, yet complete separation, of the two sides of the circuit has a tendency to condense or intensify the current. It smooths out fluctuations and causes the flow of current to stop the moment the circuit is opened. This stops arcing and consequent radio noise every time the circuit is broken.

e. **Suppressors.** Seven resistor type suppressors are used. One is inserted in spark plug circuit above each plug. The remaining suppressor is attached to the coil in the secondary circuit. Each suppressor is a resistor. Its function is to check "dribbling" of spark before and after voltage builds up to deliver the main arcing necessary in the ignition system. This cuts down on radio interference without sacrificing ignition efficiency.

123. GROUND CONNECTORS.

a. **Removal** (fig. 203). Remove nut, lock washer, and bolt which attaches each end connector to unit. Lift connector from unit.

b. **Inspection and Repair.** Examine connector, bolts, lock washers, and nuts to see if any are bent or broken. Replace broken parts. Buff off contact surfaces of connector and surfaces which it contacts on unit.

c. **Installation** (fig. 203). Position connector on unit and install the two bolts, lock washers, and nuts which attach connector to unit. Tighten nuts securely.

124. SHIELD.

a. **Removal** (figs. 201 and 202).

(1) Remove nuts, lock washers, and screws which attach distributor and coil cover to rest of shield. Lift cover from shield.

(2) Disconnect "IGN" wire and condenser lead wire from coil.

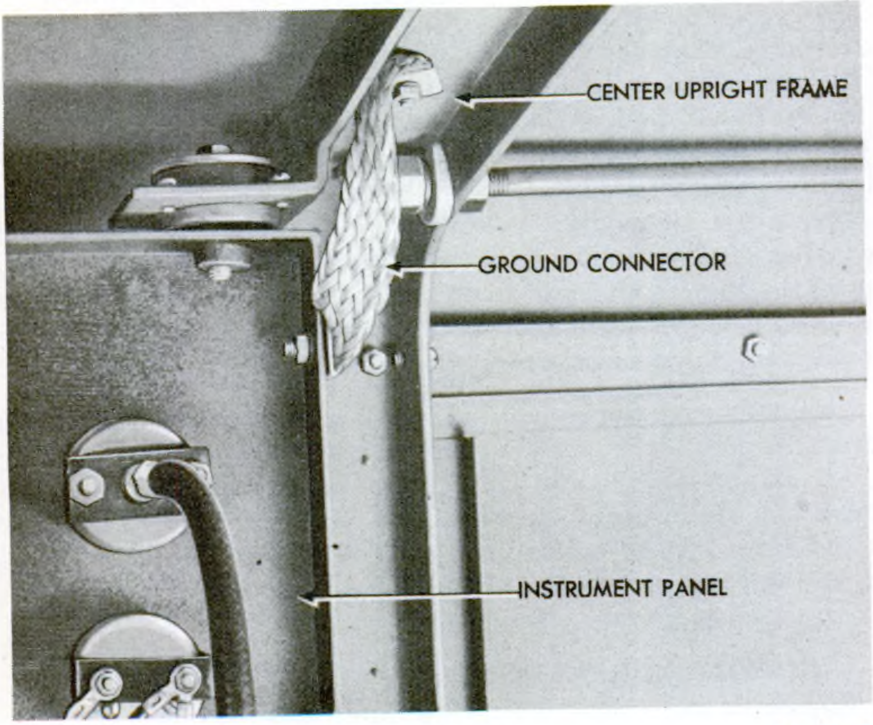
(3) Remove nuts, lock washers, and bolts which attach shield to coil bracket.

(4) Remove cylinder head cap screws which secure shield to engine. Lift shield from engine.

b. **Disassembly** (figs. 201 and 202). Remove nuts, lock washers, and screws which hold together sheet steel components of shield, and separate the parts.

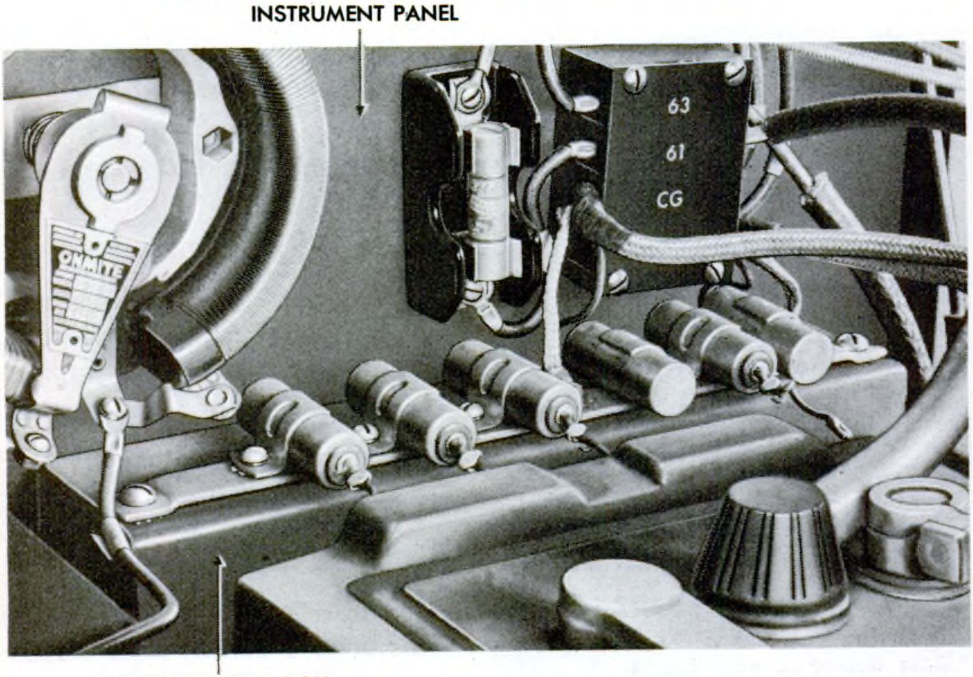
c. **Inspection and Repair.**

(1) Inspect sheet metal parts to see if they are bent or broken.


CENTER UPRIGHT FRAME
GROUND CONNECTOR
INSTRUMENT PANEL

RA PD 78576

Figure 203—Ground Connector Installed


INSTRUMENT PANEL
63
61
CG
OHMITE
LOAD TERMINAL BOX

RA PD 78594

Figure 204—Radio Noise Suppression Capacitors Installed

Bump bent parts to original shape. Replace or weld broken parts.

(2) Inspect all screws, nuts, and lock washers. These must be in perfect condition to prevent loose assembly which would render shield useless. Replace damaged parts.

d. Assembly (figs. 201 and 202). Place parts in position and install screws, lock washers, and nuts. Tighten nuts securely. Do not install distributor and coil cover until after installation of shield on engine.

e. Installation (figs. 201 and 202).

(1) Place shield in position on engine. Be sure all wires of ignition secondary circuit are enclosed. Install cylinder head cap screws which attach shield to engine.

(2) Install bolts, lock washers, and screws which attach shield to coil bracket.

(3) Connect "IGN" wire and capacitor lead wire to "IGN" terminal of ignition coil.

(4) Position distributor and coil cover on shield. Install screws, lock washers, and nuts which attach cover to shield.

125. CAPACITORS.

a. Removal (figs. 201 and 204).

(1) Disconnect capacitor lead wire from terminal or bus bar to which it is attached.

(2) Remove nut, lock washer, and screw (or screw and lock washer) which attach capacitor. Lift capacitor from unit.

b. Inspection and Repair.

(1) A short-circuited or ground capacitor will render inoperative the circuit to which it is connected. Disconnect lead and touch probes of test lamp to lead and to body of capacitor. If lamp lights, capacitor is shorted and must be replaced.

(2) Test for an open circuit by replacing capacitor with one known to function properly. If radio interference disappears, an opening in the original capacitor is indicated.

c. Installation (figs. 201 and 204).

(1) Position capacitor on generator terminal box, generator, or ignition coil, as the case may be. Install the screw, lock washer, and nut (or lock washer and screw) which attach capacitor.

(2) Connect capacitor lead wire to terminal or bus bar from which it was disconnected at time of removal.

126. SUPPRESSORS.

a. Removal.

(1) Remove nuts, lock washers, and screws which attach distributor and coil cover and spark plug cover to rest of shield. Lift covers from shield.

(2) Pull suppressors from spark plugs and ignition coil. Twist suppressors from ignition wires.

b. Inspection and Repair.

(1) Inspect suppressors to see if they are broken or if their terminals are corroded. Buff off corrosion. Replace broken suppressors.

(2) Test operation of suppressors by substituting them, one at a time, in the ignition circuit of an engine running without radio interference. Continued noninterference and otherwise satisfactory operation of the engine indicates suppressor is functioning properly. Replace suppressors whose functioning is unsatisfactory or questionable.

c. Installation.

(1) Insert ignition wires into ends of suppressor, and screw suppressor clockwise until tight. Push other end of suppressor onto its spark plug or into tower of ignition coil, as the case may be. Similarly install remaining suppressors. Be sure all suppressor connections are tight.

(2) Position spark plug cover and distributor and coil cover on shield. Install the screws, lock washers, and nuts which attach covers to shield.

CHAPTER 8

FRAME AND HOUSING

127. REPAIR OF FRAME (figs. 205 and 206).

a. If the frame should become damaged or warped, disassemble the housing and all removable units from the frame before attempting to repair. Before straightening or welding, clean with a wire brush, wash off with dry-cleaning solvent, and wipe dry with cloth. Examine for damage, paying particular attention to welds. Test doubtful welds with hammer. Inspect threads of tapped holes.

b. If frame is bent, straighten it if possible. Heat may be used, but do not heat above a cherry red. Either a sledge or an arbor press may be used to straighten members. If cold straightening is used, bend a trifle beyond true position and then bend back. This will overcome "set-back" in the metal.

c. If the frame is broken or cracked, or if the welds have become loose, repair frame by welding.

d. Clean burs from frame with a mill file. Clean up damaged threads with a tap.

128. DISASSEMBLY OF UNITS FROM FRAME, AND REPAIR OF HOUSING.

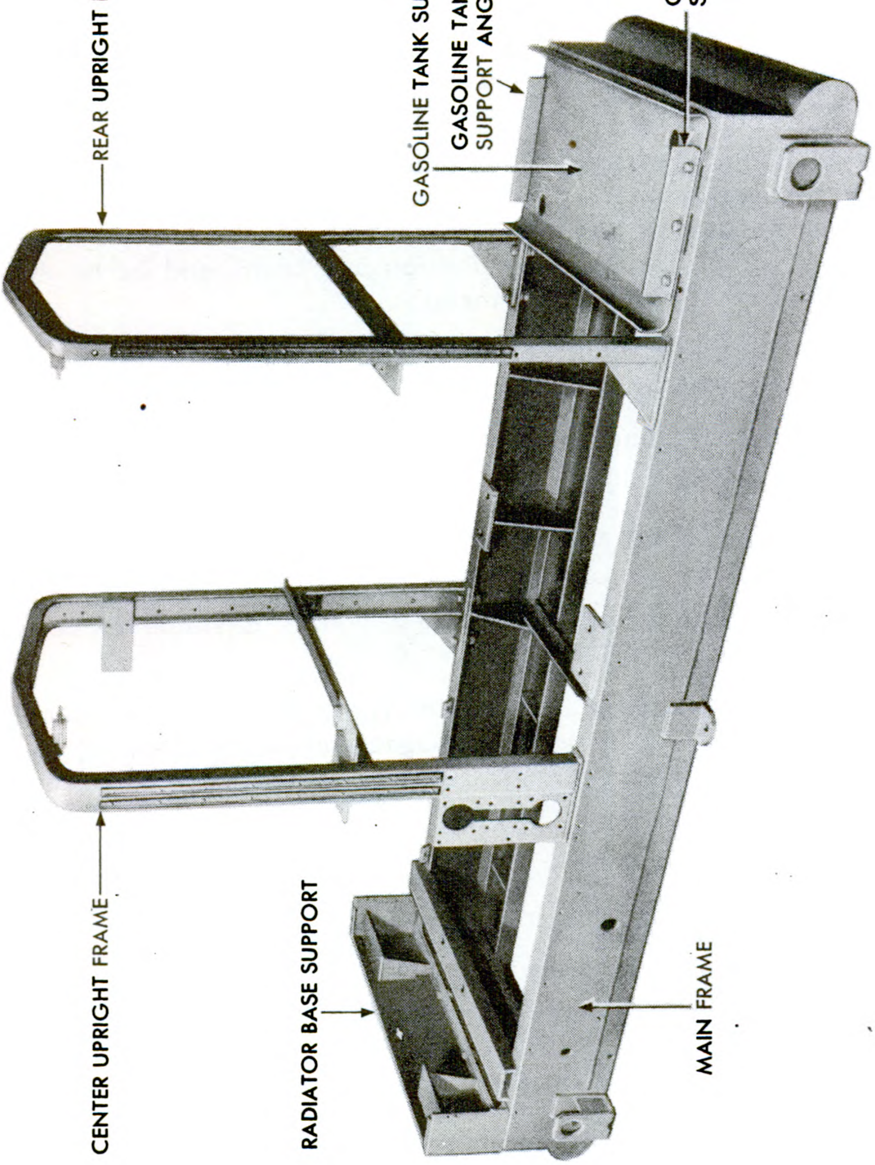
a. Remove doors, side panels, and hood. Examine metal for dents and cracks.

b. Remove fan guard and radiator (par. 28). Test radiator for leaks, and repair. Clean water passages and remove leaves, bugs, and other obstructions from air passages of core. Straighten fan guard if needed.

c. Remove gasoline tank. Clean, inspect for leaks, and repair.

d. Remove engine from frame (par. 58).

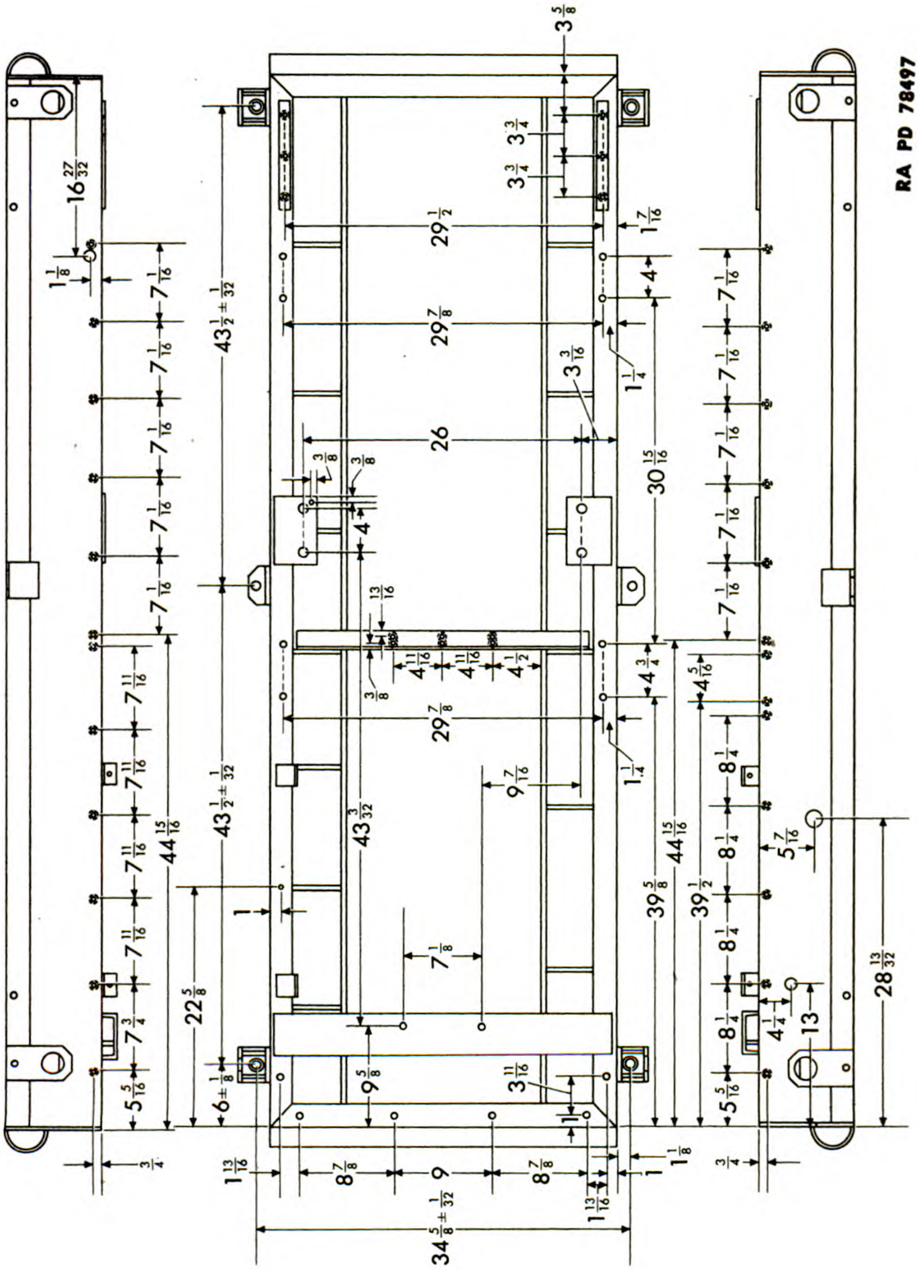
e. Remove generator from frame (par. 81).


REAR UPRIGHT FRAME
GASOLINE TANK SUPPORT
GASOLINE TANK SUPPORT ANGLE
GASOLINE TANK SUPPORT ANGLE
CENTER UPRIGHT FRAME
RADIATOR BASE SUPPORT
MAIN FRAME

RA PD 78536

Figure 205—Frame Assembled

FRAME AND HOUSING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4 11/16
4 11/16
4 1/2
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4 3/4
4 5/16
29 7/8
1 1/4
9 7/16
43 3/32
39 5/8
44 15/16
39 1/2
7 1/8
9 5/8
3 11/16
1
1 13/16
8 7/8
9
8 7/8
1 13/16
1 1/8
1
34 5/8 ± 1/32
43 1/2 ± 1/32
43 1/2 ± 1/32
22 5/8
6 ± 1/8
1
16 27/32
1 1/8
7 1/16
7 11/16
7 3/4
5 5/16
44 15/16
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8 1/4
5 7/16
4 1/4
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Figure 206—Main Frame Scale Drawing

CHAPTER 9

REFERENCES

129. PUBLICATIONS INDEXES.

The following publications indexes should be consulted frequently for latest changes or revisions of references given in this chapter and for new publications relating to materiel covered in this manual:

a.	Index (index to SNL's)	ASF Cat. ORD 2 OPSI
b.	Index to Ordnance Publications (listing FM's, TM's, TC's, and TB's of interest to ordnance personnel, OPSR, FSMWO's, BSD, S of SR's, OSSC's and OFSB's. Including alphabetical listing of ordnance major items with publications pertaining thereto)	OFSB 1-1
c.	List of Publications for Training (listing MR's, MTP's, FM's, TM's, TR's, TB's, MWO's, SB's, WDLO's and FT's)	FM 21-6
d.	List of Training Films, Film Strips and Film Bulletins (listing TF's, FS's, and FB's by serial number and subject)	FM 21-7
e.	Military Training Aids (listing graphic training aids, models, devices, and displays)	FM 21-8

130. STANDARD NOMENCLATURE LISTS.

a.	Cleaning, preserving and lubricating materials; recoil fluids, special oils, and miscellaneous related items	ORD 5 SNL K-1
b.	Harbor defense, railway and antiaircraft artillery sighting equipment and fire control instruments	SNL F-2
c.	Major items of antiaircraft artillery	SNL D-2
d.	Tools, maintenance, for repair of automotive and semi-automatic vehicles	ORD 6 SNL G-27
e.	Tool-sets for maintenance of sighting and fire control equipment	SNL F-272

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f. System, cable, M1	SNL F-207
g. System, cable, M3, M10	SNL F-244
h. Unit, generating, M18	SNL F-291

131. EXPLANATORY PUBLICATIONS.

a. Automotive Materiel.

Antiaircraft cable system and repair kits, all types and voltage controller M1	TM 9-649
Automotive electricity	TM 10-580
Automotive lubrication	TM 10-540
Chassis, body, and trailer units	TM 10-560
Fuels and carburetion	TM 10-550
Generator trailer M7 (to be superseded by TM 9-1881, when published)	TM 9-881
Generating unit M18	TM 9-617
Internal combustion engine, The	TM 10-570
Machinist, The	TM 10-445
Military motor vehicles	AR 850-15
Motor transport	FM 25-10
Motor transport inspections	TM 10-545
Ordnance storage and shipment chart-group F	OSSC-F
Sheet metal work, body, fender, and radiator repairs	TM 10-450
Storage of motor vehicle equipment	AR 850-18

b. Fire Control.

Instruction guide: Instrument repairman	TM 9-2602
Ordnance maintenance: Director M7, M7A1B1, M7A1B2	TM 9-1658
Ordnance maintenance: Directors M9 and M10, general maintenance; and computers M3 and M4	TM 9-1671A
Ordnance maintenance: Directors M9 and M10, power unit M8, tracker M2, and altitude converter M2	TM 9-1671B
Ordnance maintenance: Directors M9 and M10, wiring diagrams	TM 9-1671C
Ordnance maintenance: Director M9A2, wiring diagrams	TM 9-1671D
Ordnance maintenance: Electrical testing apparatus for fire control equipment	TM 9-1672

Ordnance maintenance: Height finder M1	TM 9-1623
Ordnance maintenance: Height finder M2	TM 9-1624
Ordnance maintenance: Remote control system M2	TM 9-1642

c. Gun Materiel.

90-mm antiaircraft gun materiel M1 and M1A1	TM 9-370
90-mm gun M1 and 90-mm antiaircraft gun mount T2E1	TM 9-371
120-mm gun M1 and 120-mm antiaircraft gun mount M1	TM 9-380

d. Maintenance.

Artillery lubrication, general	OFSB 6-4
Cleaning, preserving, sealing, lubricating, and related materials issued for ordnance materiel	TM 9-850

e. Miscellaneous.

Basic maintenance manual	TM 38-250
Decontamination	TM 3-220
Defense against chemical attack	FM 21-40
Hand, measuring, and power tools	TM 10-590
Instruction guide: Welding—theory and application	TM 9-2852

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